

# Tier 3 Pre-construction Bat Acoustic Monitoring Studies

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# Purpose of Tier 3 Bat Monitoring Studies

- 1st opportunity to conduct quantitative & scientifically rigorous studies
  - Activity patterns of bats
  - Potential risk of a proposed facility
- Acoustic surveys are a practical method for monitoring bats at wind energy facilities
  - Lower cost
  - Less invasive
  - Long-term



# Tier 3 Questions?

- Are species of concern present or likely to use facility
- What is the distribution, relative activity, & behavior of species of concern
- Is there a potential for significant adverse impacts
- How to minimize &/or mitigate impacts

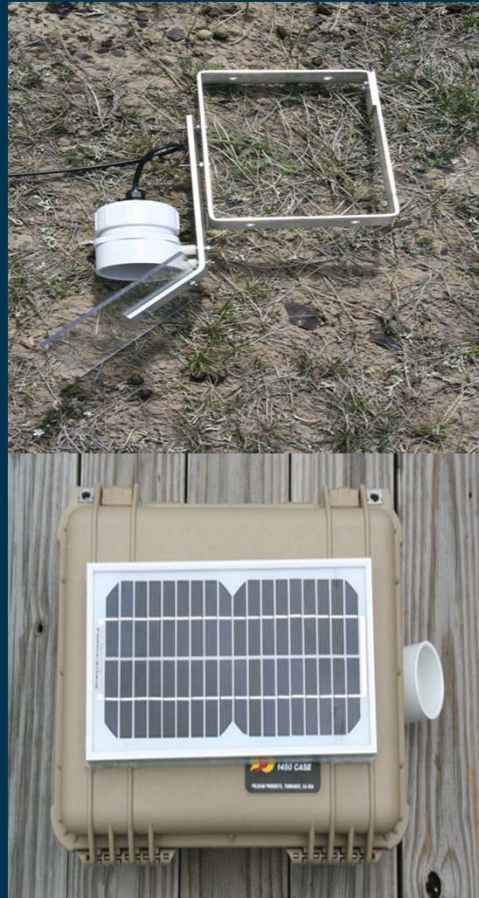


# Field Methods

- Consistent methods & metrics
  - Study design will vary from site to site
- Multiple tools may be required
  - Acoustics, mist-netting, radar, roost exit counts
- Duration & intensity to accurately characterize presence
- Multiple years to establish trends & account for temporal variation

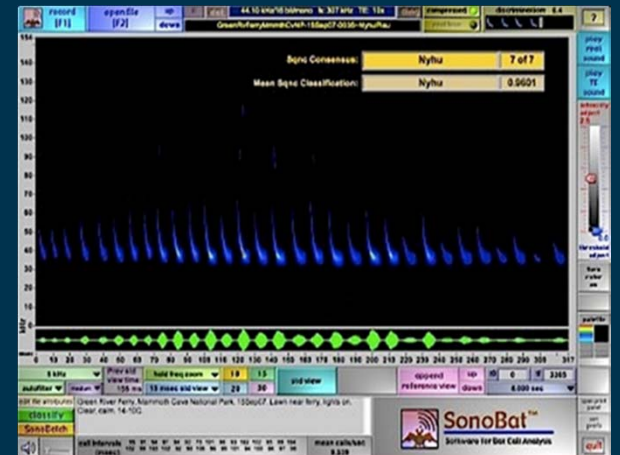
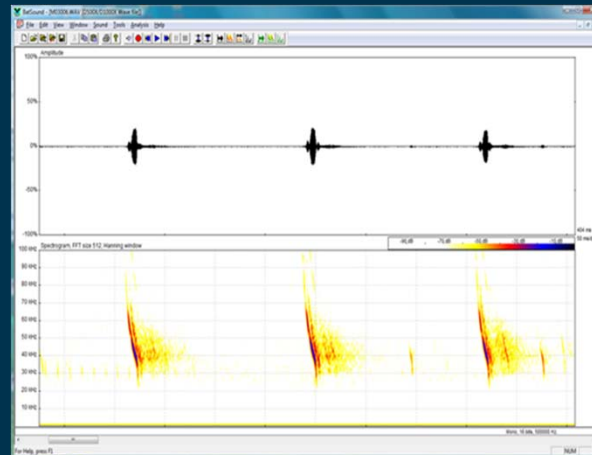
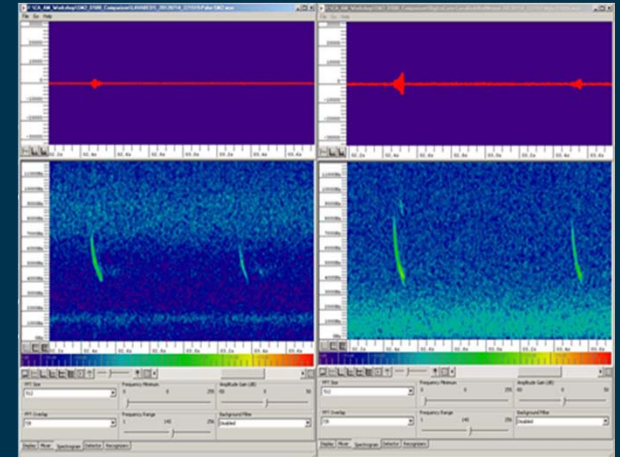
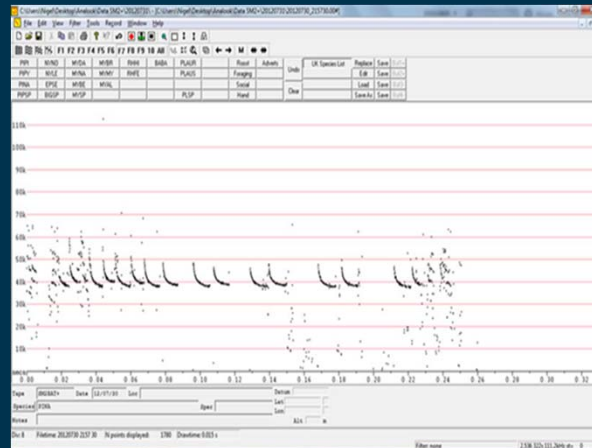
# Field Equipment

- Hardware
  - Objectives
  - Cost
  - Expertise
  - Data storage
  - Power requirements
  - Weatherproofing



# Analysis

- Software
  - Detector type
  - Objectives
  - Cost
  - Expertise
- Call ID
  - Qualitative
  - Quantitative



# Bat Acoustic Surveys

- # of detectors varies based on habitat
- Place detectors at multiple heights
- Conduct surveys when bats are active
  - Minimum spring–fall
  - In warmer climates, year round surveys
- Complimenting acoustic surveys
  - Mist-netting: demographic data & DNA
  - Radiotelemetry: roost locations & home ranges



# Limitations to Acoustic Surveys

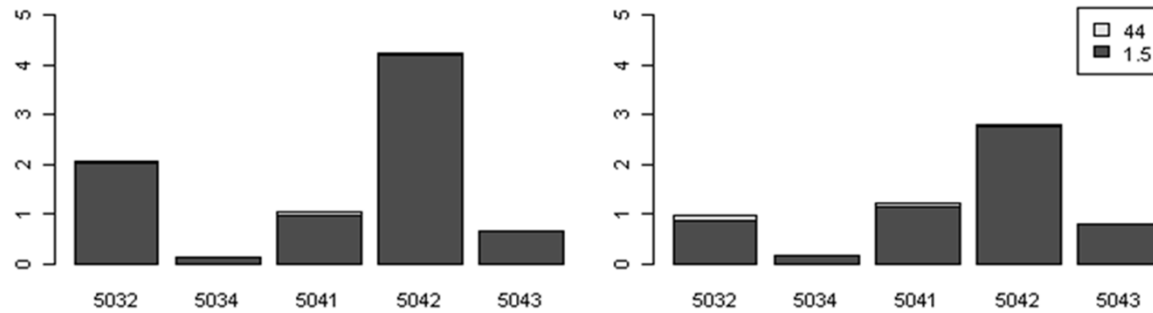
- Cannot ID individuals or determine abundance
- Detectability
  - Cone of reception small
  - Call rate, frequency, intensity, orientation, weatherproofing
- Sampling intensity
  - Temporal & spatial variability
- No consensus on what constitutes risk

# Patterns from Pre-con Acoustic Studies

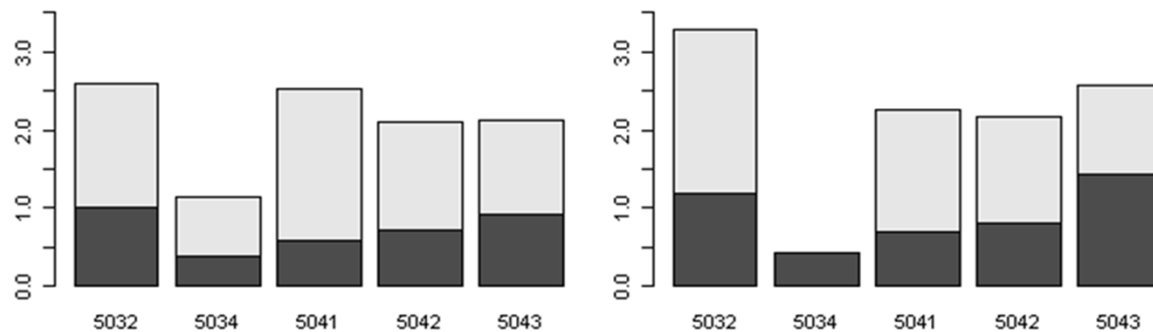
- Variation in acoustic data can be high
- Peak activity in late summer-fall, coincides with migration & mating
- Peak activity at low wind speed
  - Up to 90% occurs below 6 m/s
  - High percentage of activity occurs below 4 m/s
- Higher activity occurs on warmer nights
  - Activity may relate to insect patterns or thermoregulation

# Spatial Variation

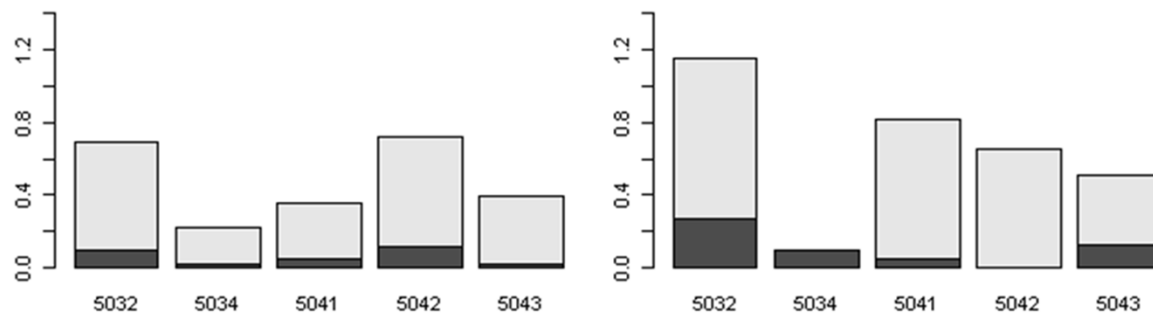
High Freq



Low Freq



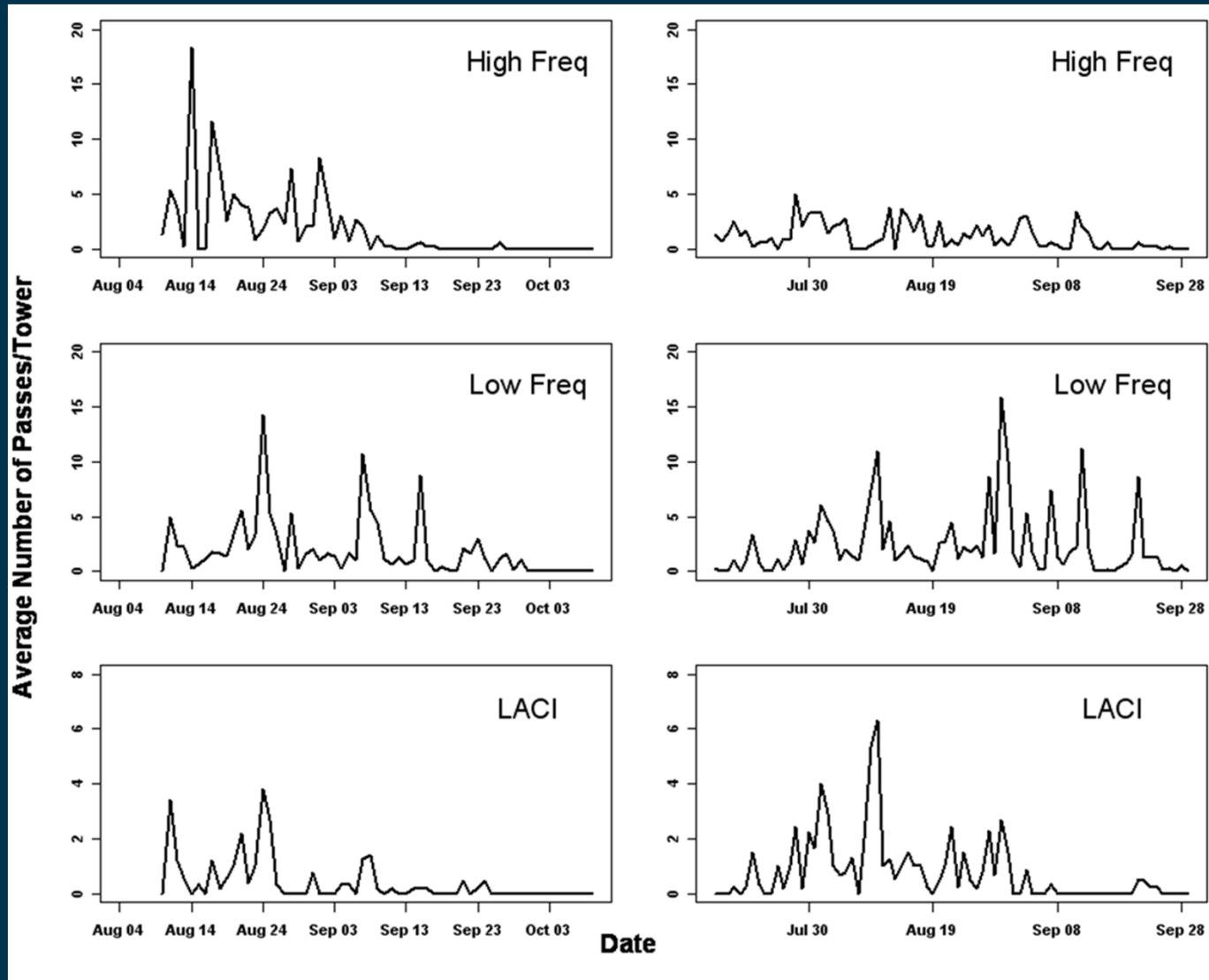
Hoary Bats



2009

2010

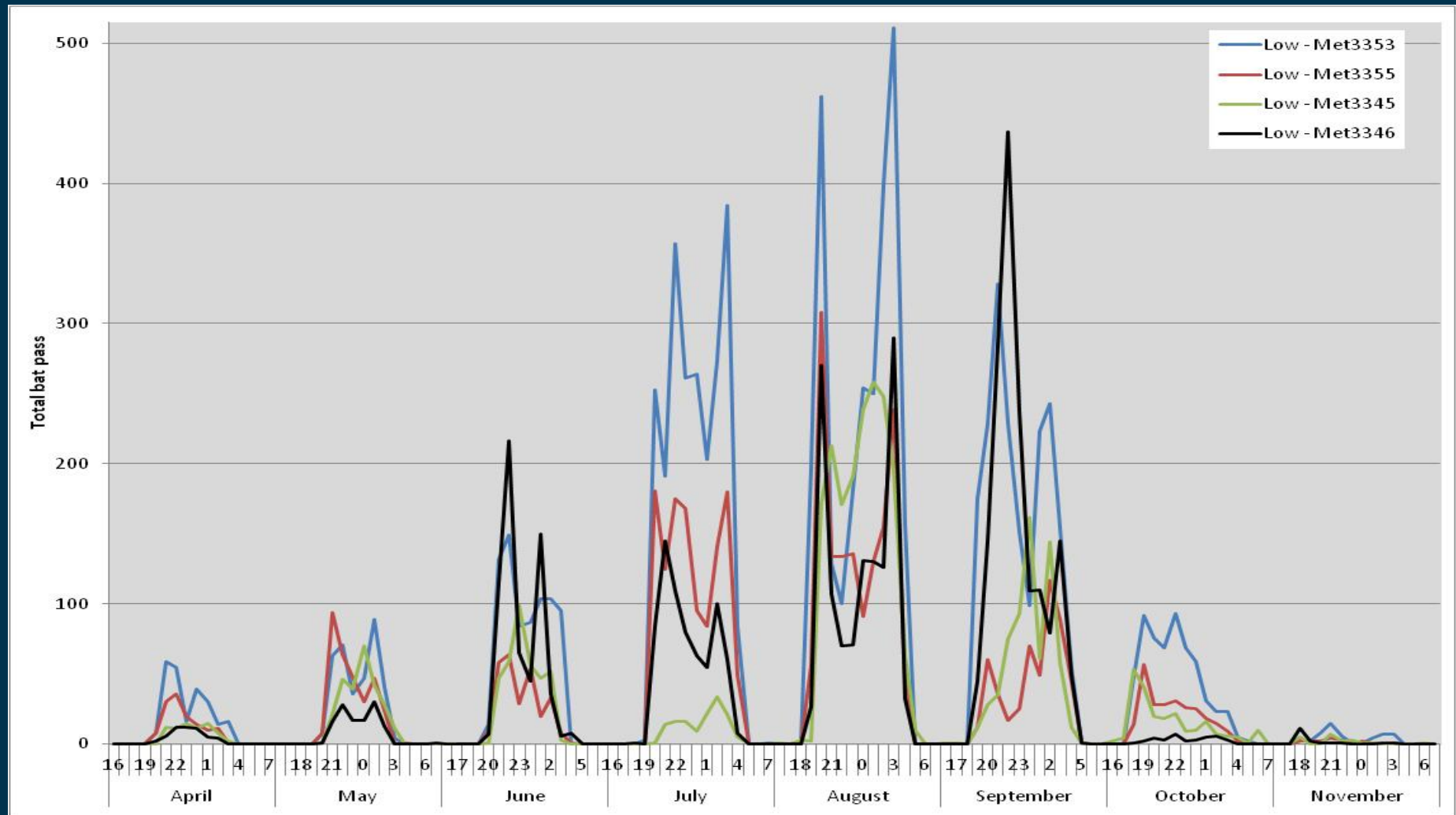
# Temporal Variation (within and between years)



2009

2010

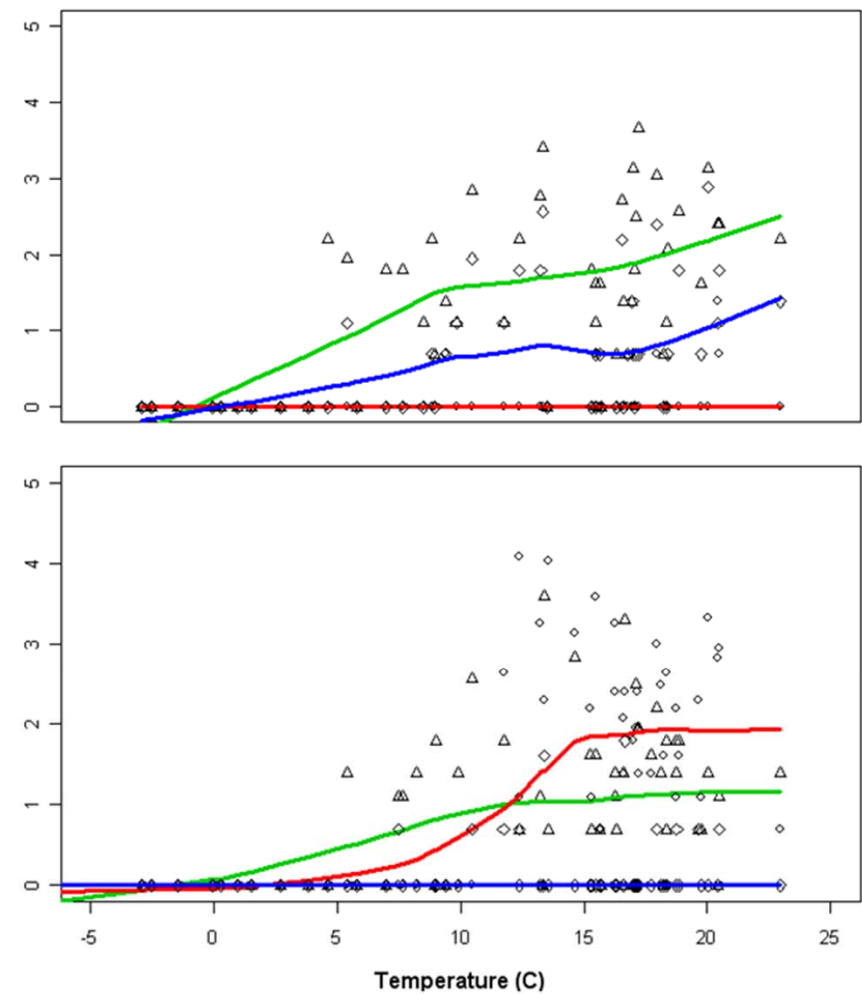
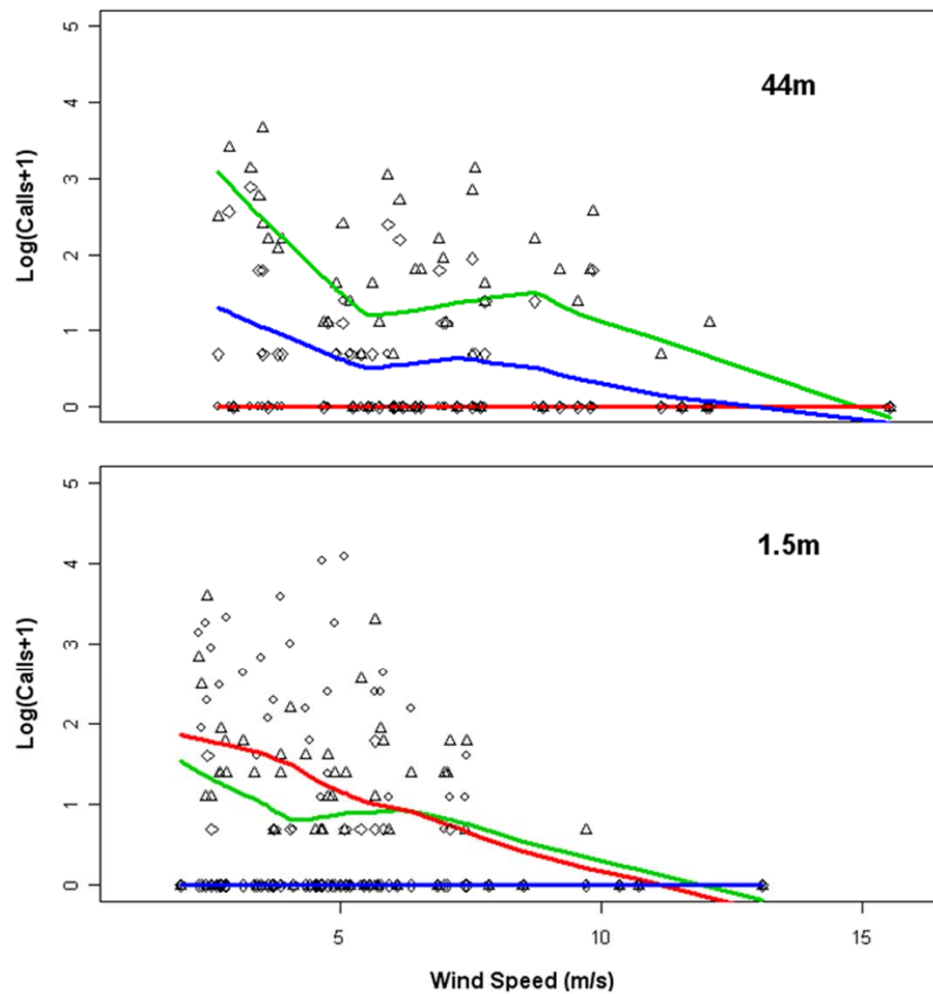
# Temporal Variation (within nights)



# Activity in Relation to Weather

Wind Speed

Temperature



— High Freq      — Low Freq      — Hoary Bats

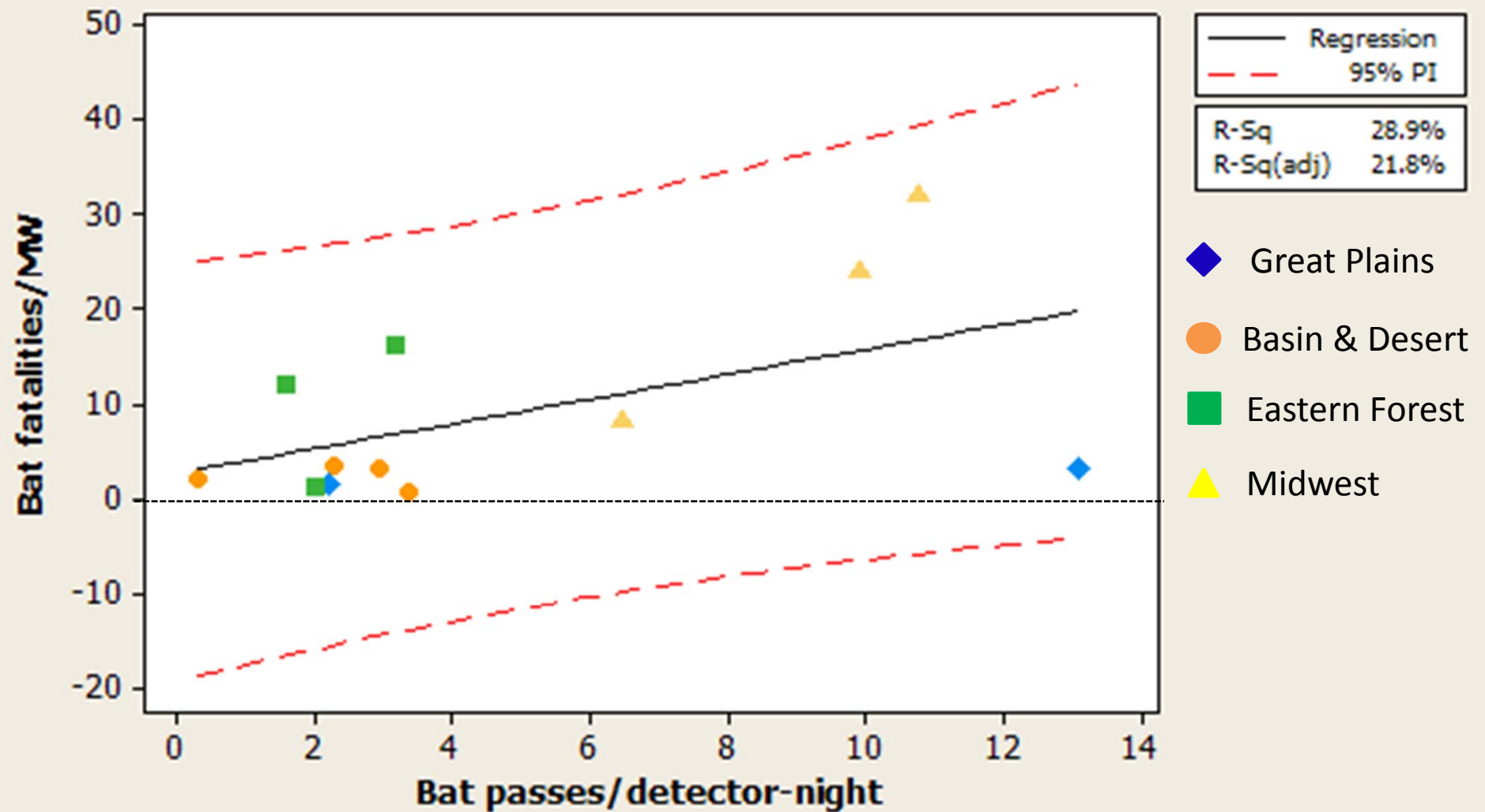
# Using Acoustic Data to Predict Risk?

- Limited ways to reduce fatalities
- Predicting risk a high priority
  - Site in low risk areas
- High activity = High fatality?
- Determining relationship problematic
  - Limited data
  - Study design: annual variation, habitat, height, metrics



## Fitted Line Plot

$$\text{fatalities/MW} = 2.659 + 1.312 \text{ Passes/det-nt}$$



# Next Steps

- Pre-con studies are valuable, particularly in new areas
- Synthesize data
  - By height, region, species or phonic group
- Species identification
- Enhance technology
- Transparency
- Communication



Thank You

